Climate Change Action Plan 2005

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR
Department of Environment and Conservation

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On The Cover

Top to Bottom, Left to Right: Robin Hood Bay Landfill, Dept. of Environment and Conservation; **Coastal Scene**, Dept. of Tourism, Culture and Recreation; **Fishing Vessels at Polar Seafoods' Wharf in Corner Brook**, Dept. of Fisheries and Aquaculture; **Dam at Reservoir, Churchill Falls**, Newfoundland & Labrador Hydro; **Moose**, Dept. of Environment and Conservation; **Children at Play**, Ben Hammett

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Message from the Minister

As Minister of Environment and Conservation, I am pleased to release the *Newfoundland and Labrador Climate Change Action Plan* as our response to this important global issue. The climate is changing, primarily due to the emission of greenhouse gases from the burning of fossil fuels. The Government of Newfoundland and Labrador recognizes the urgency of this issue and is committed to being part of the solution.

In developing our *Action Plan*, it became clear that while we must make every reasonable effort to reduce greenhouse gas emissions, we must also prepare ourselves to adapt to the eventual impacts of climate change. We can reduce emissions through reductions and increased efficiency in the use of energy in our buildings, vehicles and industrial facilities and through improvements in our waste disposal practices. Adaptation on the other hand will require us to plan for rising sea levels, increased storm action, invasive species and the potential public health impacts of climate change.

In April 2005, Government signed a Memorandum of Understanding with the Government of Canada to work together on climate change initiatives and in Budget 2005 we allocated $300,000 for the implementation of our *Action Plan* and $500,000 to advance work on the establishment of a Centre of Environmental Excellence (CEE). Once established, we see a significant role for the CEE in climate change research and project implementation. The *Action Plan* outlines 40 initiatives, some of which build on previous initiatives, such as energy efficiency in government buildings, and others that will require partnerships with the federal government and other stakeholders.

Our objectives can only be achieved through the cooperation and participation of the general public, the private sector and government institutions. In this regard, I encourage you to find a role for yourself in the *Newfoundland and Labrador Climate Change Action Plan* as well as in national initiatives. Let's all work together to take action on climate change and help to ensure a better future for our children and grandchildren.

Tom Osborne
Minister of Environment and Conservation

Executive Summary

The Government of Newfoundland and Labrador acknowledges that climate change is a serious environmental issue and that efforts are needed to stabilize and reduce our greenhouse gas emissions.

Global climate change has become an international concern since the majority of scientists have concluded that human activities are leading to an increase in atmospheric greenhouse gases (GHGs), and that this increase in gases is in turn impacting our global climate. While GHGs help insulate the Earth and maintain a temperature that can sustain life, excessive amounts of these gases upset the natural balance in the atmosphere.

The concentration of GHGs in the atmosphere is impacting the global climate at a much faster rate and higher magnitude than is thought to have previously occurred in history. The increase in global temperature is believed to be linked to a change in the flow of energy through the climate system which then impacts on the circulation patterns of the oceans and atmosphere as well as the global hydrological cycle.

It is becoming clear that climate change could impact regional economies and lifestyles. In terms of this Province, some predictions can be made:

- Rising sea level and increased wave-energy at the coast is likely to intensify erosion and destruction of coastal structures.
- Sea ice is expected to become thinner and less extensive, which could have positive impacts on marine transportation and the oil and gas industry. In other areas, however, the coastline may be more vulnerable to wave action and storm surges leading to coastal erosion and damage to coastal infrastructure.
- Climate change may result in more extreme weather events, such as hurricanes. These events increase the risk of flooding of coastal areas with major impacts on coastal infrastructure.
- Changes to the marine ecosystem could influence distribution, growth and migration patterns of important fish species.
- The forestry and agriculture industries could be impacted by changes to air and soil temperatures that may positively influence growth rates of plants and trees, but may also lead to more severe insect outbreaks. Increased severity of storms may also damage crops and forests.
- The changes to the local ecosystem may also impact upon public health.

Framework for Action

The federal government formally ratified the Kyoto Protocol on December 17, 2002. The Kyoto Protocol is a key international agreement that sets emissions reduction targets for industrialized countries. The Protocol came into effect on February 16, 2005. Canada's target is to reduce emissions to six per cent below 1990 levels by 2012. To reach this target, the federal government released its implementation plan, *Moving Forward on Climate Change: A Plan for Honouring our Kyoto Commitment*, in April 2005.

Neither the federal commitment to the Kyoto Protocol nor the federal implementation plan bind the Province to any specific course of action. However, many goals in the federal plan coincide with those of the Province. The Province is looking forward to working with the federal government on areas of common interest. The federal and

provincial governments have already signed a Memorandum of Understanding on Climate Change to facilitate joint initiatives.

The provincial *Climate Change Action Plan* will complement many of Government's ongoing policy objectives and commitment to sustainable development. Key environmental and energy issues for Government include waste management, air quality and review of the Province's electricity policy. These issues, and many others, are connected directly and indirectly to this *Action Plan*. This *Action Plan* will establish a framework for current and future initiatives, both in terms of mitigation of GHG emissions and adaptation to the impacts of climate change. The *Action Plan* is intended to be a "living document". It will be revised and updated to reflect changes in economic conditions and emerging technologies. By taking action to address climate change, Government will be taking action towards development of a more sustainable society and economy.

Actions

Intergovernmental Relations

ACTION 1 The provincial government will cooperate with federal / provincial / territorial agencies with respect to joint initiatives and the attainment of national objectives.

ACTION 2 The provincial government will facilitate access to federal implementation funding by supporting submissions by public and private sector agencies.

ACTION 3 The provincial government will participate in the development of national and local strategies that address the long-term impacts of climate change and identify appropriate adaptation initiatives.

ACTION 4 As per commitments under the New England Governors / Eastern Canadian Premiers (NEG/ECP) *Climate Change Action Plan*, the provincial government will dedicate resources to compile data on energy consumption, vehicle fuel use and emissions from government operations.

Government Operations

ACTION 5 Government will develop a House-in-Order (HIO) Strategy which will include elements of the commitments under the NEG/ECP, in particular fleet management and purchase of low emissions office equipment.

ACTION 6 Government will establish an energy use reduction target for provincial buildings and work towards its implementation.

ACTION 7 Government will examine the possibility of "bundling" remaining public buildings to take advantage of economies of scale in retrofitting smaller facilities that otherwise would not be economical to retrofit.

ACTION 8 Government will work to raise awareness among employees on climate change.

Transportation

ACTION 9 Government will develop an information campaign aimed at motorists to make them aware of linkages between climate change and auto usage.

ACTION 10 Government will establish idle free zones around public buildings to reduce emissions of greenhouse gases and other contaminants.

ACTION 11 Government will conduct a feasibility study for development of commuter parking areas at key junctions.

ACTION 12 Government will study the energy efficiency of the provincial ferry fleet in an effort to reduce fuel consumption and greenhouse gas emissions.

Human Health

ACTION 13 Government will continue to raise the profile of climate change and health among public health professionals in this Province.

ACTION 14 The provincial government will monitor policy developments within the Canadian and international health communities on tools and methods to assess the potential impacts of climate change on public health.

Ecosystem Health

ACTION 15 Government will promote and implement climate change monitoring in provincial protected areas.

Education

ACTION 16 Government will partner with post-secondary institutions on climate change initiatives.

ACTION 17 Government will continue to provide support for the Newfoundland and Labrador Climate Change Education Centre.

Municipalities

ACTION 18 Government will continue to work internally and with Memorial University of Newfoundland to assess the vulnerabilities of local communities to climate change.

ACTION 19 Government will work to educate key decision-makers about the impacts of climate change and engage them in dialogue on appropriate adaptation strategies.

ACTION 20 The provincial government will organize a workshop on climate change impacts and adaptation for local municipalities.

ACTION 21 Government will establish an interdepartmental committee to develop a provincial land use policy.

ACTION 22 Government will require that infrastructure projects receiving public funds meet a standard set of criteria with respect to climate change.

ACTION 23 Government will encourage all municipalities to participate in the Federation of Canadian Municipalities climate change programs and will facilitate participation of small or unincorporated communities.

Industry

ACTION 24 Government will continue dialogue with industry and to advocate for climate change strategies that are in the interest of local industry.

Buildings

ACTION 25 Government will promote energy efficiency in public and low income housing.

Natural Resource Industries

ACTION 26 Government will partner with academic institutions, industry and stakeholders to promote local research initiatives on carbon management.

ACTION 27 Government will continue to monitor developments in climate change science, decisions around carbon accounting and the impacts on forest management. Government will share this information with industry with an intent to revise the provincial forest management planning process and guidelines where appropriate.

ACTION 28 Government will initiate dialogue with Fisheries and Oceans Canada, industry and stakeholders on climate change mitigation and adaptation.

ACTON 29 Government will work with industry partners and fishers to review regulations and policies limiting vessel lengths with a view to advocating for federal regulatory changes that will promote safety and fuel efficiency of vessels.

ACTION 30 Government will raise awareness among members of the fishing industry on climate change impacts and emerging safety issues.

ACTION 31 Government will encourage the development and implementation of technologies, equipment and vessel design to increase fuel efficiency and safety aboard vessels.

ACTION 32 Government will develop partnerships to encourage research on local climate change impacts on the fishing and aquaculture industries.

ACTION 33 Government will engage industry stakeholders, other government departments and non-governmental organizations in research and development of new commercial fisheries species.

ACTION 34 The provincial government will work in cooperation with the federal government and research institutions to promote policies that advocate sustainable harvest levels for commercial fisheries in light of climate change.

ACTION 35 Government will implement long-term environmental monitoring and assessment for existing and potential aquaculture sites.

ACTION 36 Government will promote the consideration of climate change impacts in areas of the Province that have initiated efforts towards Integrated Coastal Zone Management Planning.

ACTION 37 The provincial government will promote climate change awareness at the planning stages of Marine Protected Areas with a view to encouraging research and adaptive management in these areas.

Renewable Energy

ACTION 38 Government will implement an energy plan to ensure that all energy sources are used first to provide a reliable, affordable supply of power for domestic use and for Province-wide economic developments, and then to take advantage of business opportunities in export markets to sell energy that is in excess of our needs on terms that secure maximum benefits for the Province.

Sustainable Development

ACTION 39 Government will include climate change considerations in its Sustainable Development Strategy.

ACTION 40 Government will report annually on the provincial *Climate Change Action Plan*.

The Science of Climate Change

Climate change is, to a certain extent, a naturally occurring phenomenon. Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are "greenhouse gases" that help insulate the Earth and maintain a temperature that can sustain life. However, scientists have concluded that human activities have led to an increase in atmospheric greenhouse gases (GHG), which is impacting the global climate. Activities such as the burning of fossil fuels and deforestation have led to a 30 per cent rise in carbon dioxide levels since the Industrial Revolution.[1] This, in turn, is changing the composition of the earth's atmosphere. The increasing concentration of atmospheric greenhouse gases is causing temperatures to rise and affecting the global climate. Carbon dioxide, as a product of combustion, is by far the most abundant greenhouse gas released by humans. Other gases, such as N_2O, have, in fact, more heat-trapping potential and a longer lifespan in the atmosphere.

Potential Impacts

Although the greenhouse effect is natural, the current concentration of GHGs in the atmosphere is impacting global climate change at a much faster rate and higher magnitude than is thought to have previously occurred in history. Over the last century, the average global temperature increased by 0.6 degrees Celsius (°C).[2] Even with the international efforts to curb GHG emissions, the average global temperature is expected to continue to increase between 1.4 °C and 5.8 °C over the next century. This is a significant increase considering that global temperature has risen only 5°C since the last Ice Age.[3] The increase in global temperature is believed to be linked to a change in the flow of energy through the climate system which then impacts on the circulation patterns of the oceans and atmosphere as well as the global hydrological cycle.

"The 20th century was the warmest the world has seen in 1000 years; the 1980s and 1990s were the warmest decades on record."

Government of Canada. Climate Change in Newfoundland and Labrador Factsheet.

The Carbon Cycle

The carbon cycle is a complex process in the natural environment by which carbon is continuously cycled between reservoirs in the ocean, on land and in the atmosphere. Carbon exists in the atmosphere as carbon dioxide and in ocean in the form of dissolved carbon dioxide. On land, carbon is found in organic matter in soil and trees and also in carbonate rocks such as limestone or coral. Carbon is also stored deep inside the Earth in deposits of fossil fuels — coal, petroleum and natural gas. In nature, photosynthesis takes carbon dioxide out of the atmosphere and traps it in vegetation, while an opposite process of respiration releases carbon back into the atmosphere. Carbon dioxide is also released from the ocean in the tropics and trapped again in cold waters. This cycling of carbon throughout nature is a balanced process. Human activities such as deforestation and burning of fossil fuels have upset this balance by releasing more carbon dioxide into the atmosphere more quickly than can be "recycled" by nature.

The climate in Canada is also changing. Over the last century, Canada's average temperature increased by 1°C. This increase was not equal across the country: the largest increases were observed in the central, northwest and northern regions while temperature decreases occurred in the regions furthest east.[4] The predicted changes are far more complex than indicated by changes in average temperature throughout the year. There are likely to be changes in winter and summer extreme temperatures as well as in precipitation patterns.

Canada's large size means that changes in climate will vary from region to region. Even within regions, different impacts will be observed. Within the Atlantic region, Newfoundland and Labrador will experience different impacts than say Prince Edward Island. Changes on the Island of Newfoundland will even be different from those predicted for Labrador. It is clear that climate change could greatly impact regional economies and lifestyles. The modelling of potential climate changes and analysis of impacts tends to be done at the national or regional level and does not necessarily reflect local circumstances. Not enough is known about the potential local impacts and more research is needed. Nonetheless, some predictions can be made.

Sea level has been rising in most of Atlantic Canada for thousands of years due to slow warming trends, melting polar ice and thermal expansion. Rising sea level and increased wave-energy at the coast will intensify erosion and destruction of coastal structures. The Intergovernmental Panel on Climate Change predicts that global sea level may increase 50 cm by 2100.[5]

Over the long term, sea ice is expected to become thinner and less extensive. This could have positive impacts on marine transportation and the oil and gas industry. However, in other areas, such as the Gulf of St. Lawrence, the coastline may be more vulnerable to wave action and storm surges leading to coastal erosion and damage to coastal infrastructure.

Climate change is expected to result in more extreme weather events, such as hurricanes or other storms. The increase in frequency and / or intensity of storms also increases the risk of flooding of coastal areas with major impacts on coastal infrastructure, including saltwater intrusion into coastal drinking water aquifers. Flooding is already a problem in some parts of the Province. Flood damages over the last 15 years have exceeded $40 million.[6]

In the fishing sector, changes to ocean temperature and currents could influence distribution and migration patterns of important fish species. Growth rates and recruitment could also be affected. Species such as cod are influenced by water temperature, both in terms of their geographic distribution and individual growth.

The forestry and agriculture industries could be impacted by changes to air and soil temperatures that may positively influence growth rates of plants and trees. These changes may also lead to more severe insect outbreaks. Also increased severity of storms may damage crops and forests through erosion, ice, blowdowns or fires.

The changes to the local ecosystem may also impact upon public health. For example, the bacteria associated with Lyme Disease was recently found in this Province where it had not been seen before. Similar situations may arise with other bacteria or viruses. More analysis is necessary to predict local impacts on health. ■

Climate Change Policy

Global climate change became an international concern in the early 1990s. Talks began at the United Nations (UN) towards the end of 1990 to draw up a global agreement on climate change. At the subsequent 1992 Earth Summit in Rio de Janeiro, Canada signed the United Nations Framework Convention on Climate Change (UNFCCC), the first major international agreement on climate change.

Following as an addendum to the UNFCCC, the Kyoto Protocol was developed in 1997. The Protocol set binding emissions reductions for the world's industrialised nations. To enter into force the Protocol required ratification by 55 parties to the UNFCCC, which account for 55 per cent of the industrialised world's emissions of carbon dioxide in 1990. Canada's target is to reduce GHG emissions to six per cent below 1990 levels during the first commitment period, 2008-2012. Canada ratified the Protocol in 2002. The Protocol finally came into force on February 16, 2005.

Neither the UNFCCC nor the Protocol sets emissions targets for developing countries. The agreements are based on the premise that industrialized countries are responsible for most of the global greenhouse gas emissions and have the greatest capacity to reduce their emissions.

Between 1998 and 2001 the international community held a series of meetings to work out a plan of action for implementation of the Protocol. Individual countries are free to design their own implementation plans within a framework which outlines the rules for accounting and reporting of the Kyoto mechanisms – international emissions trading, Joint Implementation, and Clean Development Mechanism.

Parties to the UNFCCC are now beginning discussions on the targets for the second commitment period.

Canada's Plan

The federal government released its *Climate Change Action Plan for Canada* in November 2002. In the federal budget of February 2003, the Government of Canada announced its intention to spend $2 billion over five years on the implementation of Canada's climate change plan. The federal plan placed emphasis on funding for science and technology and energy efficiency. In August 2003, $160 million was allocated for emissions reductions initiatives in partnership with the provinces and territories and another $30 was earmarked for initiatives in aboriginal or northern communities.

The federal government released an implementation plan in April 2005. This updated plan provides for investments of about $10 billion for the period leading up to 2012. It enhances the funding available for partnerships with the provinces and territories ($250 million per year); creates a Climate Fund of at least $1 billion; and allocates $600 million for renewable energy and $2 billion for existing climate change programs.

Provincial Position

The Government of Newfoundland and Labrador acknowledges that climate change is a serious environmental issue and is committed to taking action to help stabilize and reduce greenhouse gas emissions. Many of the environmental and developmental challenges facing the Province today are intertwined. The provincial *Climate Change Action Plan* will complement many of Government's policy objectives and existing strategies. The federal commitment to the Protocol does not bind the Province to any specific course of action, but some goals in the federal plan do coincide with those of the Province.

In April 2005, the Province and the Government of Canada signed a Memorandum of Understanding (MOU) on Climate Change based on priorities important to this Province. The MOU will allow the two governments to build partnerships and ensure a consistent, coordinated approach to addressing climate change

ACTION 1: The provincial government will cooperate with federal / provincial / territorial agencies with respect to joint initiatives and the attainment of national objectives.

The *Action Plan* provides the basis for some of the project proposals under the federal government's Partnership Fund. However, the response to climate change will require a long-term commitment well beyond such initial activities. Many initiatives will be developed over time and as appropriate technologies and policies develop.

ACTION 2: The provincial government will facilitate access to federal implementation funding by supporting submissions by public and private sector agencies.

The Province's commitment to the *Climate Change Action Plan* must be tempered by its fiscal ability to fund specific projects and initiatives. However, the Province will make its best effort, in cooperation with the federal government and the private sector, to deliver on commitments in the *Action Plan*.

The federal and provincial governments have different areas of constitutional legislative authority respecting the environment. Nothing in the Plan should be taken as an acknowledgment or admission by the Province of federal authority in any area of jurisdiction which may be within provincial jurisdiction, or a waiver of the ability to challenge same. ■

Courtesy: Dept. of Environment and Conservation

The Honourable Tom Osborne, Minister of Environment and Conservation and the Honourable John Efford, Minister of Natural Resources Canada, signing the Canada-Newfoundland and Labrador Memorandum of Understanding for Cooperation on Addressing Climate Change, April 29, 2005.

Mitigation and Adaptation

Climate change is a broad, complex issue that has the potential to impact many aspects of our society. As such, it will require a comprehensive response. In the debate on climate change, two responses are generally discussed – mitigation and adaptation.

Mitigation refers to measures that reduce emissions of greenhouse gases or increase the number and capacity of carbon "sinks", or reservoirs, such as forests. Mitigation activities typically focus on reducing the combustion of fossil fuels, the primary source of carbon dioxide. Such activities may include energy retrofits to buildings, fuel switching to lower carbon fuels, more energy efficient technologies or even public campaigns to promote public transportation over private vehicles. Mitigation may also be related to activities that reduce other greenhouse gases such as methane from landfill sites or nitrous oxide from the use of chemical fertilizers. Carbon sinks forests and soils absorb and store carbon dioxide. Carbon sinks help to mitigate climate change by removing carbon dioxide from the atmosphere.

The Kyoto Protocol deals primarily with mitigation and much of the debate around the Protocol focuses on determining the most appropriate measures to reduce GHGs emissions.

It is widely recognized that reducing emissions will only slow climate change. Climate change is a process that has already begun; many experts therefore believe that part of our response include adaptation to the changes. Adaptation refers to "measures taken in response to actual or expected changes in climate."[7] It involves assessing the possible impacts of climate change to the social, economic and physical environments, identifying vulnerabilities or potential for enhanced viability and taking actions to adapt to both positive and negative impacts. There are five categories of adaptation measures[8]:

- Preventing loss through actions that reduce vulnerability;
- Tolerating loss by doing nothing to reduce vulnerability and instead absorbing the impact;
- Spreading the burden or risk of the loss among a wider population;
- Changing activities that are not sustainable; and
- Changing the location of the activity, population or system.

Adaptation measures may have high initial costs but are expected to reduce the long-term costs from climate change. These measures may include revisions to building codes, upgrades to infrastructure or increased planning and emergency preparedness.

The discussion around mitigation has had a strong national and international focus. While there is much that individuals can do to reduce their personal greenhouse gas emissions, successful mitigation will involve commitments from governments and industries around the world to devise a less carbon-intensive global economy. The Province can participate in mitigation strategies by reducing its internal emissions and, in partnership with the federal government and industry, create conditions that encourage movement toward this new economy. Adaptation strategies, on the other hand, will have to be more focussed on local conditions, impacts and opportunities. There is a need for the Province to balance its involvement in mitigation and adaptation. Without eventual reduction of greenhouse gas emissions and without appropriate long term planning, adaptation will be very expensive in the long-term. ■

ACTION 3: The provincial government will participate in the development of a national and local strategies that address the long-term impacts of climate change and identify appropriate adaptation initiatives.

Sectoral Analysis and Actions

GOVERNMENT

Framework for Action

Government is involved in climate change initiatives which stem from commitments made at the Conference of New England Governors / Eastern Canadian Premiers (NEG/ECP). In 2001, the NEG/ECP tabled a Climate Change Action Plan that outlines greenhouse gas reduction goals for the region and established a Climate Change Steering Committee to begin implementing the plan. The Steering Committee established specialized work groups for addressing the potential categories of actions outlined in the Plan: energy, transportation, inventory and registry, adaptation and "leading by example". The committee identified two priorities for implementation of the plan: 1) development of a regional emissions inventory and recommendations for a regional emissions registry so that participating jurisdictions would have common data and methodologies for measuring progress, and 2) identification of initial climate change actions that could be implemented quickly, cost-effectively, and serve as a foundation for building widespread support for additional actions. The NEG/ECP goal is to reduce

Courtesy: Dept. of Environment and Conservation

Confederation Building, St. John's

end-use emissions of GHGs through improved energy efficiency and lower carbon fuels within the public sector by 25 per cent by 2012, as measured from an established baseline.

The Department of Environment and Conservation has worked closely with the Department of Natural Resources on formulating provincial policy on climate change. Much of the policy discussion has been led by developments on the national or international scene. However, as the Province becomes increasingly active on this issue, dedicated resources and a clear direction are needed to ensure the management of local emissions data and

ENERGY PERFORMANCE CONTRACTING

Energy performance contracting (EPC) refers to energy management services that are provided by the private sector to facilities on a performance basis. Energy management generally involves three components: Increased energy efficiency (eg. upgrades to building envelope, improved operation and maintenance or introduction of higher efficiency processes and products); Fuel substitution; and Co-generation. Contractors are paid on the basis of savings achieved.

The EPC industry in Canada has evolved over a period of approximately 15 years. In the past, most EPC projects were in the institutional sector (schools and hospitals) and government offices, but there is evidence that EPC is expanding to new markets in the private sector as well. The development of an international greenhouse gas emissions market may serve as a catalyst for growth in the EPC industry.

coordination of local actions and initiatives. Although Government has already taken steps towards reducing GHG emissions from internal operations through actions on energy efficiency and waste reduction, the linkages are not always made between such activities

Action 4: As per commitments under the NEG/ECP Climate Change Action Plan, the provincial government will dedicate resources to compile with data on energy consumption, vehicle fuel use and emissions from government operations.

and emissions reductions. This can be rectified by mandating a department or division to be responsible for collection of data, monitoring and reporting of climate change actions.

The Department of Environment and Conservation is currently developing a government-wide House-in-Order (HIO) Strategy to reduce greenhouse gas emissions from Government operations. This initiatives corresponds with elements of the NEG/ECP Climate Change Action Plan and includes activities such as the establishment and reporting of GHG reduction targets for government operations, energy efficiency improvements for buildings and

Action 5: Government will develop a House-in-Order Strategy which will include elements of the commitments under the NEG/ECP, in particular fleet management and purchase of low emissions office equipment.

vehicles, the development of a green procurement program and employee education. GHG emissions reductions tend to be at the facility level and thus little or no measurement or monitoring is taking place. The development of a HIO Strategy will finally allow Government to measure the reductions in the amount of waste, energy use and GHG emissions produced from Government operations and to monitor progress on a government-wide basis.

Energy Retrofit of Public Buildings

Energy Performance Contracting (EPC) has been a means of carrying out energy retrofits to public buildings in the health care sector since the early 1990s. A number of EPC projects with limited scope were carried out in the Waterford Hospital, the Carbonear General Hospital, the Notre Dame Bay Health Centre and the original Janeway Hospital.

Throughout the 1990s, energy retrofit projects in the health care sector accounted for over $2 million in annual energy savings. While these projects were not designed with climate change in mind, the reduction

Action 6: Government will establish an energy use reduction target for government buildings and work towards its implementation.

of greenhouse gases through reduced energy consumption is a co-benefit to the direct energy savings. The projects included upgrades or replacement of such systems as lighting systems, boiler plants or energy management control systems.

A regional EPC project is already anticipated for the Avalon region. Once this project is underway, most of the larger hospitals and nursing homes in the Province will have been retrofitted. However, there are still numerous small health care buildings throughout the Province that could benefit from upgrades. It would not be economical to retrofit these buildings on an individual basis, however, an EPC project could be designed around a number of these facilities together, thus creating an economy of scale.

Energy retrofit of remaining public buildings will undoubtedly be a challenging process. With older buildings retrofitting can become an extremely expensive process when all the necessary upgrades are taken into account. Thus far, the various government departments or agencies involved in energy retrofits have been doing so with no centralized direction. If Government is to make a commitment to reducing its overall energy use and greenhouse gas emissions, then future projects of this nature should be undertaken on a more systematic basis. The collection of baseline data and reporting of energy savings needs to be recorded in a central location so that it will be possible to keep track of the impact that these projects have on greenhouse gas emission levels.

ACTION 7: Government will examine the possibility of "bundling" remaining public buildings to take advantage of economies of scale to retrofit smaller facilities that otherwise would not be economical to retrofit.

In addition to building upgrades for the health care sector, there are many schools, municipal and other government building throughout the Province that can be made more energy efficient. Some work has already been done by the Department of Education and the Department of Works and Transportation. Again, data from these projects should be collected and analysed by a dedicated body and planning for future energy retrofit projects.

Educating Employees

Government will also work to educate public service employees to take actions as individuals that reduce greenhouse gas emissions. There are many ways this may be done. Employers across the country are becoming increasingly aware of the need to promote employee wellness and many of the activities that increase physical activity and wellness such as those that encourage alternative transportation also reduces an individual's contribution of GHG emissions. The federal government, with the assistance of climate change education hubs across the country, is promoting the One Tonne Challenge (OTC) for individuals to reduce their own emissions. There may be opportunities for provincial employees to get involved in this, or other similar, challenges.

ACTION 8: Government will work to raise awareness among employees on climate change.

TRANSPORTATION

The transportation sector is responsible for the approximately 40 per cent of GHG emissions in this Province. While technology has been able to reduce some of the harmful emissions from the operation of motor vehicles, the production of the most common greenhouse gas, carbon dioxide, is still directly related to the amount of fossil fuel used. Where alternatives to fossil fuels are used or fuel consumption is reduced, less carbon dioxide is produced.[9]

Reduced fuel consumption also means less cost. Approximately 60,000 to 70,000 trucks bring goods into this Province each year. The relatively small, widespread population and huge geographic area leads to high trucking costs for the transport of freight, especially in terms of fuel consumption. Between 1980 and 2000, transport truck diesel consumption increased by 130 per cent. To maintain the Province's road system, the Department of Transportation and Works uses on average five to six million litres of

Courtesy: Dept. of Transportation and Works

Trucks traveling on provincial highway

diesel fuel each year in its 656 pieces of highways equipment. Cost to the Department is between $4 million and $5 million each year.[10]

ACTION 9: Government will develop an information campaign aimed at motorists to make them aware of linkages between climate change and auto usage.

The Government of Newfoundland and Labrador would like to encourage behavioural change in the transportation sector through increased public awareness and education, promotion of more fuel efficient cars and changes in driving behaviour, and voluntary commercial best practices. For vehicle fleets, fuel efficient vehicle replacements and improved maintenance will also be promoted.

Fleet Management & Professional Driver Training

Building on the Province's commitments under the NEG/ECP Climate Change Action Plan, the Province has partnered, and will continue to partner, with the federal government to promote professional training for heavy equipment operators and fleet managers. Demonstration projects across Canada have shown that driver training reduces fuel consumption. The training will be available to private and public sector operators of diesel equipment such as transport trucks, highways maintenance trucks, heavy construction equipment and school buses. Our efforts in this regard are supported by Natural Resources Canada through their Fuel Management 101 and Smart Driver programs. Participants are provided with all necessary training materials (videos and information packets) in order to implement training of their own operators in their respective organizations. Provincial fleet managers and equipment operators will participate and the Province intends to promote this initiative to as many organizations as possible which have significant sized operations. In addition to significant reductions in fuel consumption and GHG emissions, professional training has other co-benefits related to reduced brake and exhaust maintenance and reduced number of oil changes. Training also leads to generally safer and improved handling of vehicles.

Idle Free Zones

The average car produces three or four times its own weight in CO_2 annually. Running the vehicle when parked, or idling, is a common habit that wastes fuel and creates CO_2 emissions needlessly. Motorists can avoid unnecessary fuel consumption by turning off their vehicles in situations where they are going to be

ACTION 10: Government will establish idle free zones around public buildings to reduce emissions of greenhouse gases and other contaminants.

stopped for more than a few seconds such as waiting for a passenger or when running errands.[11] The establishment of "idle free" zones is a way to educate

Local Research

Researchers at Memorial University and Environment Canada are partnering on an ongoing study on the impacts from storms and winds on transportation in southwestern Newfoundland. The ferry terminal at Port-aux-Basques is the major entry port for the Island for both passengers and freight, and is the only passenger ferry to the Island operating year-round. Leading to Port-aux-Basques is a notorious stretch of the Trans-Canada highway at an area known as Wreckhouse where strong winds often close the highway to traffic. Any disruption of transportation system in these areas is extremely important to the public. The research includes a study of geomorphic impacts and an economic impact analysis. While the research is not yet complete, preliminary results indicate that easterly winds, rather than westerly hurricanes, have the greatest impact on ferry traffic and closure of traffic in Wreckhouse area. The frequency and severity of wind events at Wreckhouse appear to have increased in the past 30 years. Delays to ferry service also increased slightly in 2004 compared to 2003. Results of the study will be communicated to local municipalities, stakeholders and residents."

drivers and encourage them to reduce their emissions. Some jurisdictions in the United States have gone so far as to introduce regulations or municipal bylaws limiting the amount of time vehicles can be left running.

Individual Transportation Choices

Public transit is often promoted as an environmentally friendly transportation alternative to single vehicle use, but due to a variety of reasons, public transit has not been terribly successful in this Province. Nonetheless, Government must work to educate the public about the impact of individual choices on the environment and encourage efficiencies where possible. A number of national products have been developed for motorists. These could be adapted to Newfoundland and Labrador's particular circumstances and disseminated locally.

Courtesy Dept. of Environment and Conservation

Car idling in front of the Health Sciences Centre, St. John's

Government can endeavour to incorporate climate change issues into transportation planning to encourage efficiencies where possible. With the growth of bedroom communities around urban areas, more and more people are commuting longer distances to work. Many of these people already participate in car pools and this trend should be encouraged. In other Atlantic provinces, gravel parking areas have been installed near key junctions of major routes to allow commuters to park vehicles

Action 11: Government will conduct a feasibility study for development of commuter parking areas at key junctions.

Courtesy: Dept. of Environment and Conservation

Trucks in downtown St. John's: Example of trend toward large, less fuel efficient passenger vehicles.

and pool together to continue the commute to major centres. Some commuter parking areas have developed spontaneously at local locations such as the Roche's Line / Trans Canada junction. These areas are not currently serviced in any way (for example, winter snow clearing). An organized program of installation of parking areas could provide more secure and accessible options for commuters.

Marine Transportation

The Department of Transportation and Works, Marine Services Division, operates 10 marine ferries throughout the Province. The energy efficiency of the provincial ferry fleet is not known. The use of modern marine diesel engines or newer technologies could result in considerable fuel savings. A fuel efficiency audit and inspection program is necessary to determine the efficiency of the fleet and to indicate whether there are cost-effective options available to increase efficiency. Depending on the outcome of the audit, a program for upgrading the fleet may be developed.

Adaptation

Although the transportation sector is most often associated with climate change in terms of the GHGs released, our transportation systems are vulnerable to a variety of climate impacts and measures need to be taken to adapt to anticipated impacts. In terms of the physical environment, climate change could lead to many impacts on transportation systems. The combination of sea level rise and storm surges could threaten roads and highways in coastal areas. Approximately 60 per cent of roadways in this Province are situated within five kilometres of the coast.[12] Changes in sea ice, iceberg migration and sea conditions could impact on marine transportation. Extreme weather events, such as heavy snow or rainfall, may occur with more frequency and intensity as the climate changes and transportation systems are vulnerable to these events.

Action 12: Government will study the energy efficiency of the provincial ferry fleet in an effort to reduce fuel consumption and greenhouse gas emissions.

We already have examples of how extreme weather can impact movement of people and goods in various parts of the Province.

February 2003 - Severe blizzard closed all highways in the St. Anthony area during two days and resulted in many children being stranded in the area's schools.

April 2003 - Heavy rains lead to flooding and landslides. A bridge at Pinchgut Brook partially collapses as a result of high water levels and closes a section of the Trans Canada Highway 20 km west of Corner Brook. The cost to replace the collapsed bridge was estimated at $750,000 to $1 million.

May 2003 - Heavy rains damage a number of highways in the Province, especially on the Baie Verte Peninsula. Flood waters washed out 80 metres of a highway at Burlington, isolating the community of Smith's Harbour and part of Burlington. Until the road was repaired, the only way out of Smith's Harbour was by sea.

There are economic costs associated with the upkeep and repair of these systems and there may be human costs as well if routes become inaccessible during extreme weather events.

The study of climate change impacts and adaptation in the transportation sector is relatively recent when compared with other sectors.[13] For this reason, adaptation actions will need to focus initially on data collection and analysis of impacts.

Courtesy: Constable D. Burridge, RCMP

Beaches - Damage during storm in 2004

HUMAN HEALTH

Mitigation of greenhouse gases from the health care sector has been discussed previously in the chapter on government actions. As explained in previous sections, climate change is already affecting the physical environment. Many of the current and expected changes to the physical environment can also influence the health status of human populations. Climate change is expected to have both direct and indirect impacts on human health. It is important that the health sector start to consider climate change in policy, program and service delivery planning.

Human health can be directly impacted by manifestations of climate change such as extreme weather events (e.g., hurricanes) and thermal

Local Health Conference

On September 19-20, 2004, the Canadian Institute of Public Health Inspectors – Newfoundland and Labrador Branch (CIPHI – NL) hosted a provincial conference for public health and environmental professionals to generate discussion, and raise awareness of global health issues, including climate change, which may affect our Province.

The workshop featured presentations from a local climate change expert, Dr. Norm Catto, of Memorial University, and Climate Change Meteorologist, Mr. Gary Lines, of Environment Canada. The conference was attended by 45 participants from provincial and federal government departments, private industry, and health organizations, with backgrounds in public health, environment, animal health, and climatology. The comments received from participants highlighted the unique opportunity provided for professionals from a variety of backgrounds to discuss issues common to all.

extremes (e.g., heat waves). Extreme weather brings with it risk of death or injury due to floods, storms or other disasters that may occur when populations are not prepared for such events. All over the world, humans have been able to adapt and thrive in a range of temperatures, but without acclimatization, vulnerable populations may suffer in the face of extreme changes in temperature. It has been

Action 13: Government will continue to raise the profile of climate change and health among public health professionals in this Province.

estimated that without acclimatization to climate change, in 2050 there could be between 240 to 1140 additional heat-related deaths in Montreal, 230 to 1220 in Toronto, and 80 to 500 in Ottawa.[14] Thousands of deaths in France were linked to a heat wave in Europe throughout the summer of 2003. Whether or not the heat wave can be linked to climate change, the French example shows how a health system can be overwhelmed if not prepared for public health emergencies.

Air pollution is linked to cardiorespiratory illnesses, in particular asthma. There are various ways climate change might influence the exposure to air pollution. Climate change may change weather patterns and lead to changes in local or regional pollution concentrations. Climate change may also affect natural sources of air pollutant emissions and change the distribution and types of airborne allergens.

Climate change is expected to lead to an increase in, or redistribution of, vector-borne diseases. Warmer temperatures expand the area and extend the seasons in which many diseases can be transmitted. Temperature also affects the rates of insect biting and the maturation of the micro-organisms that these insects carry. Three diseases of concern whose transmission to humans may be related to climate change are Lyme Disease, Rabies and West Nile Virus.

Lyme Disease is rarely fatal in humans but can cause long-term medical problems. In 2001, the bacteria that causes Lyme Disease was first observed in a tick found on the island portion of the Province. The first actual case of Lyme Disease in the Province was identified in an animal in October, 2004. It is not known whether we have permanent populations of the tick that carries Lyme Disease has or whether the ticks were carried to the Province on migratory birds.

The risks of contracting Lyme Disease in Newfoundland is unknown although it is thought to be low based on national information. No cases have been reported in Labrador.

Rabies is a deadly viral disease spread by the bite of infected animals and is most commonly seen in red or arctic foxes. It is thought to exist permanently in Labrador and has occasionally been found on the

Confirmed cases of rabies in Labrador in 2004

Island. The most recent outbreak on the Island was in 2002 which led to a large scale eradication program. The Island was declared rabies-free again in 2004. While climate change may be a factor in the spread northward of some vector-borne diseases, Rabies could potentially spread southward. If climate change leads to increased arctic ice along the coast, we may see more foxes arriving on the Island from Labrador, and therefore an increased risk of the spread of Rabies. In 1988, an outbreak in Labrador did in fact spill over to the Great Northern Peninsula and it is assumed that the foxes arrived across the ice.

West Nile Virus (WNV) is another disease of concern that may be affected by climate change. Since WNV was first seen in North America in the New York area in the late 1990s, it has spread northwesterly across the continent. So far, there has been no evidence of WNV in this Province, nor has the potential for it to become established been identified. However, surveillance on this disease, and the others, continues.

Changes in quality and quantity of water is another predicted impact of climate change that can affect human health. Increases in temperatures, prolonged summer seasons and drought or increased heavy rainfall could lead to changes to water levels and flows which in turn could lead to contamination of drinking water. For example, if sewer systems become overwhelmed with excess water during periods of heavy precipitation the introduction of contaminants into local water supplies could result and cause serious illness.[15]

Action 14: The provincial government will monitor policy developments within the Canadian and international health communities on tools and methods to assess the potential impacts of climate change on public health.

Ecosystem changes throughout Canada can also impact upon nutritional health and food supplies. Summer precipitation levels are expected to decrease in much of North America which will likely impact the productivity of agriculture. We have recently seen drought conditions in the Prairie provinces which have seriously impacted the region's agricultural sector. Vulnerable sectors of society such as low income groups will be especially at risk for deteriorating nutritional health.

The Health Canada document *Climate Change and Health & Well-Being in Canada's North* states that:

> Climate change has implications for a wide range of public health programs in the North such as those associated with mental health, nutrition, water and air quality, disease monitoring and surveillance, disaster preparedness and relief, search and rescue, housing and shelter, education and awareness, and children's environmental health.[16]

Significant changes in water resources, food sources and other parts of specific ecosystems have been reported in parts of Labrador.[17] These changes can have both negative and positive impacts on local health status. Participants in a study by Furgal et. al. (2002) entitled, *Climate Change and Health in Nunavik and Labrador: what we know from science and Inuit knowledge*, indicated that some areas in Labrador are now inhabited by species such as moose which were not previously seen in those areas. Study participants in Labrador also indicated that climate changes were impacting the availability and heath of food species and plants, as well as their ability to access these foods.[18]

The ability of the health sector to adapt to the socioeconomic and physical impacts of climate change depends on a number of factors including resources, quality of public health infrastructure,

institutional capacity and arrangements and existing diseases.[14] Since the vulnerabilities will be different in different regions, further assessment and study is needed to determine how climate variability will affect the health of sub-populations in our society and how adaptations can be made.

Ecosystem Health

It is expected that the Canada's northern regions, including Labrador, will experience greater variation in climate over time than other regions of Canada. Climate change is also expected to lead to many changes in the northern ecosystem including:

- loss of permafrost,
- changes to wildlife patterns,
- increased frequency of extreme weather and
- changes to ice distribution and stability.

It is important that Government continue to monitor the effects of climate change on both the physical environment and population dynamics of species in an effort to maintain biological diversity.

Terrestrial Protected Areas

Protected areas provide refuge for species and assure future suitable habitat and viable population diversity. The Department of Environment and Conservation is responsible for the establishment and management of the six types of provincial protected areas in Newfoundland and Labrador: wilderness reserves, ecological reserves, provincial parks, wildlife reserves, Crown reserves and special management areas. Currently, there is a total of 54 provincially protected areas covering some 16, 153 km^2 or 4 per cent of the Province. There is also an additional 12 federally protected areas which results in a total area of 18,300 km^2 or 4.6 per cent of the Province. More

Courtesy: Dept. of Environment and Conservation

Caribou in Labrador

areas need to be protected to adequately protect the full range of our natural diversity and to improve our resilience to the impacts of climate change. Government is currently developing a Protected Areas Strategy outlining a systematic approach to the protection of our natural heritage. This important conservation action can ultimately make a significant contribution towards a sustainable, resources-based economy.

The Department of Environment and Conservation, Parks and Natural Areas Division, is partnering with Memorial University on a project that monitors the impacts of climate change on the rare plants of Burnt Cape Ecological Reserve on the Great Northern Peninsula.

Action 15: Government will promote and implement climate change monitoring in existing and future provincial protected areas.

EDUCATION

The importance of education in addressing climate change cannot be stated enough. Education on this issue has to be broad enough to include all aspects of this phenomenon: science, direct and indirect impacts (biophysical, socioeconomic and health), measures for reducing greenhouse gas emissions and measures to adapt to a changing climate.

Government is exploring opportunities to partner with post-secondary institutions on initiatives related to climate change mitigation and adaptation. As per commitments under the NEG/ECP Climate Change Action Plan, two post secondary institutions in this Province, Memorial University of Newfoundland (MUN) and College of the North Atlantic, have signed on to the goals of the NEG/ECP plan to reduce their institutions' greenhouse gas emissions to 10 per cent below 1990 levels by 2012.

The Department of Environment and Conservation would also like to work with MUN to take advantage of funding sources for climate change research. We will be dedicating resources to facilitate identification of opportunities and development of proposals.

ACTION 16: Government will partner with post-secondary institutions on climate change initiatives.

Government is actively working with Memorial University, the Sir Wilfred Grenfell College, local industry and stakeholders to expand on the environmental experience in the Corner Brook region through the development a Centre of Environmental Excellence (CEE). In the recent 2005-2006 Budget, Government allocated $500,000 towards this initiative. One of the Centre's objectives will be to develop mechanisms to reduce greenhouse gas emissions and help Canada meet its Kyoto commitments. The Centre's proposed focus on forestry management, environmental tourism, information technology applications for the environmental sector, and support to industry will also help advance climate change initiatives.

ACTION 17: Government will continue to support the Newfoundland and Labrador Climate Change Education Centre.

The Department of Environment and Conservation routinely responds to requests for information on climate change, both on the issue of emissions reductions and impacts and adaptations. However, the Department does not have a unit dedicated specifically to environmental education and therefore partners with other groups to raise awareness about climate change. The Province is currently a partner in funding the Climate Change Education Centre (CCEC). This Centre, which is hosted by the Conservation Corps of Newfoundland and Labrador (Conservation Corps), is part of a national network of public education and outreach hubs. The CCEC is currently mandated to focus educating the public about emissions reduction measures and does not deal with adaptation strategies.

Government sees the CCEC as vital to increasing awareness around the science and impacts of climate change and encouraging individuals to take actions to reduce their personal GHG emissions. An extended funding arrangement will allow for more program development and a more consistent approach to public education. Government believes that the CCEC can build on the success of the Conservation Corps' youth-related environmental programming to bring the message of climate change to this important audience.

Where appropriate, Government will work to raise awareness on climate change to other target audiences such as public sector employees or motorists. Some such initiatives are outlined elsewhere in this *Action Plan*.

Public education about specific adaptive measures is not a priority at this time as most adaptation strategies are unlikely to be based on individual actions. Adaptation research thus far involves long-term planning at the systems or community level rather than the household level. Education around adaptation will be directed at decision-makers in the various levels of government and professional bodies involved in planning. The Department of Environment and Conservation participates in discussions with other jurisdictions on the development of a national adaptation strategy. The Department was also involved in the organization of a regional impacts and adaptation workshop through the NEG/ECP. A regional adaptation strategy is the next step for this group.

Avalon Mall, St. John's during Tropical Storm Gabrielle in 2002

Province's response to climate change, especially in adapting to the local impacts of climate change. Many of the impacts of climate change will be felt directly at the community level and are related to public health and safety as well as protection of property and the environment. Steps will need to be taken at the community level to reduce vulnerabilities. Currently,

ACTION 18: Government will continue to work internally and with Memorial University of Newfoundland to assess the vulnerabilities of local communities to climate change.

MUNICIPALITIES

Municipalities represent the level of government closest to individuals where they live. As such, municipalities have a practical role to play in the some municipalities across Canada are becoming involved in GHG reduction initiatives, but proactive planning for climate change impacts remains less common. There are a number of key adaptation

LOCAL RESEARCH

Researchers at Memorial University have applied for funding from the Climate Change Impacts and Adaptation Program and from the Office of Critical Infrastructure Protection and Emergency Preparedness (OCIPEP) to carry out local studies. One OCIPEP-funded project investigates and quantifies the risks to selected communities from flood events. The first phase of the project involves an evaluation of three areas in the Province with a history of flooding but for which there is currently no flood risk mapping. The data to be compiled is expected to be of value for local land use and emergency preparedness planning. This project may launch a community-based process of climate change planning by giving local decision-makers the information they need to plan for potential changes.

Courtesy: Dept. of Natural Resources

Developments in the coastal zone should take potential climate change impacts into account.

activities in which a municipality can become involved: land use planning, emergency planning, review of standards, codes and regulations, infrastructure upgrades and water and energy conservation.[20]

As outlined earlier in this *Action Plan*, the impacts expected to occur in our Province include sea level rise, storm surges and shoreline erosion. Climate change impacts such as these on the coastal zone should be of particular interest to local municipalities since much of the development in this Province is in

ACTION 19: Government will work to educate key decision-makers about the impacts of climate change and engage them in dialogue on appropriate adaptation strategies.

coastal areas. With these problems, flooding events could become more prevalent and should be considered in municipal and emergency planning. For example, depending on the circumstances, a major flooding event could cut off access to key evacuation routes as well as to emergency services and hospitals.[21]

Another predicted impact is a change in precipitation: winters may become wetter while summers are expected to become drier. Water use restrictions

ACTION 20: The provincial government will organize a workshop on climate change impacts and adaptation for local municipalities.

during the summer, which over the last few years have become a fact of life for communities on the northeast Avalon, indicate that new measures must be adopted to ensure that municipalities have adequate supplies of water when needed.

There is a cost for adaptation measures, but there are also high costs associated with not being adequately prepared for the impacts of climate change. When Tropical Storm Gabrielle struck the City of St. John's in 2002, damages from flooding exceeded $400,000. The costs associated with damage from various extreme weather events are significant and, according to recent trends, are likely to increase.[22]

Local communities can consider climate change impacts and develop adaptation measures through better municipal planning. Currently in this Province,

municipal plans only apply to incorporated towns; local service districts and unincorporated areas do not have an ability to plan and tend to depend on Crown lands infilling limits to limit local development.

Newfoundland and Labrador does not currently have a comprehensive land use policy that would provide a framework by which adaptations strategies could be integrated into land use planning. The Urban and Rural Planning Act allows for the development of land use policies.

Action 21: Government will establish an interdepartmental committee to develop a provincial land use policy.

More education and awareness is needed for municipal officials about climate change and good planning practice. If planners were aware of the specific vulnerabilities of their community, then they would be able to ensure that municipal plans related to infrastructure, emergency measures and land use address the issues and reduce vulnerabilities. Government can assist communities with the research necessary to define the potential effects that will likely occur as a result of climate change and related issues and concerns. Municipalities need to know how to collect baseline data from which to start their planning actions and how to establish a program to monitor changes so that local plans can be adapted to accommodate any further changes in parameters.

Action 22: Government will require that infrastructure projects receiving public funds meet a standard set of criteria with respect to climate change.

There is funding available nationally for research related to climate change impacts and adaptations. The research community in this Province has expressed its interest in collaborating on more of this type of research.

As a key funding source for municipal infrastructure projects, the Province can influence the inclusion of climate change considerations into infrastructure development projects.

Municipalities, especially the larger ones, also have a role to play in reduction of GHG emissions. Municipal governments can reduce emissions in various ways, including investing in sustainable transportation, land use planning, energy retrofits to municipal buildings or solid waste management. Individual municipalities may not see the reduction of greenhouse gases as part of the core services they deliver.[23] However, the rationale for municipalities to reduce GHG emissions is much the same as in other sectors; reduced energy use, for example, can save the municipality money as well as reduce emissions.

Action 23: Government will encourage all municipalities to participate in the Federation of Canadian Municipalities climate change programs and will facilitate participation of small or unincorporated communities.

Across the country, the Federation of Canadian Municipalities (FCM) has been active in lobbying for the interests of municipalities in the implementation of the federal climate change plan, such as the inclusion of landfill gas projects as offsets and municipalities in domestic emissions trading. The FCM also houses the Partners for Climate Change (PCP) program to assist municipalities in reduction of their greenhouse gas emissions. Over one 100 Canadian municipalities are now involved in this program. The program includes a model resolution

for municipalities and a five-step framework for action. The FCM also administers the Green Municipal Funds for the Government of Canada. These two funds, the Green Municipal Enabling Fund (GMEF) and the Green Municipal Investment Fund (GMIF) provide funding for municipalities to conduct emissions inventories and develop their own local action plans. In this Province, only five municipalities have joined the PCP program — Gander, Marystown, Conception Bay South, Mount Pearl and St. John's have signed the resolution to participate. The local municipalities which have become involved in the PCP program are among the larger ones with the human resources to become involved in such a program. Most of the communities in this Province are quite small and it is doubtful whether they would have the human and financial resources to participate. Mechanisms must be developed to enable smaller communities to find ways to reduce their GHG emissions as well. The Department of Environment and Conservation is involved in ongoing discussions with FCM on how to include smaller municipalities in GHG reduction programs.

Climate Change and Water Resources

It is expected that climate change will impact the water resources of the Province by changing precipitation, water temperature, and sea water levels. This in turn will impact the water quality and quality of water resources. This can also potentially impact the frequency and magnitude of drought, flood and other extreme events such as ocean surges. This variability in water quality in conjunction with changes in water temperature would also impact the quality of our water resources, the water chemistry and associated aquatic life. Wetlands and coastal zones are particularly vulnerable to increased climatic variability and given that most Newfoundland and Labrador communities are located along the coastline this can have potentially devastating socio-economic implications.

The Water Resources Management Division (WRMD) of the Department of Environment and Conservation is proactively participating in research and development on climate change impacts, vulnerabilities and adaptation strategies by carefully monitoring the results from its hydrometric, water quality and climate networks. These three environmental quality-monitoring networks provide valuable insights into the impacts of climate change on water resources. Recent analysis of data from the water quality network indicates changing trends in the water quality of water bodies located in pristine environments. These trends in major ions, turbidity, and colour have no other reasonable causal factor other than climate change. The WRMD will keep a close watch on trends in stream flows, lake levels, rainfall, snowfall, water quality and flood frequency to identify any climate change impacts, identify vulnerabilities and to design adaptation strategies.

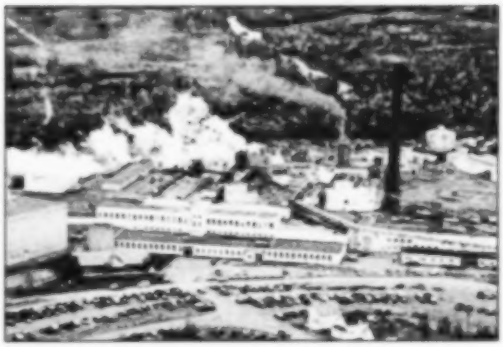
As the effects of climate change become more pronounced over time, water use conflicts could arise. The WRMD is keeping an inventory of water uses and is closely supervising the issuance of water rights to balance environmental and developmental concerns.

INDUSTRY

In implementing our *Action Plan*, we must balance the need to reduce greenhouse gas emissions with the need to continue to grow our economy and ensure the competitiveness of our industry. Government believes that this can be achieved by first promoting voluntary, "no-regrets" measures that would pay for themselves or achieve other policy objectives not specifically related to climate change. The approach must take advantage of the Province's strategic resource interests, such as hydroelectricity, the development of which would result in lower emissions by displacing other energy sources. However, the Province must also develop a plan that treats our other industries, such as oil and gas, fairly and recognizes the contribution these industries make to the provincial economy. The success of a provincial plan will depend largely on stakeholder involvement and commitment.

Action 24: Government will continue dialogue with industry and to advocate for climate change strategies that are in the interest of local industry.

It is clear from studies undertaken both within the Province and nationally, that measures taken to reduce greenhouse gases primarily relate to reductions in energy consumption and improvements in process efficiency. Many such initiatives offer relatively short term paybacks and long term operations cost savings. Our large industries fall into the Large Final Emitters (LFE) group identified under the federal climate change plan. This group includes pulp and paper, mining, petroleum production and thermal electricity generation. These industries are among the major contributors to GHG emissions in this Province, but are also major contributors to our economic sustainablity. The federal climate change plan requires that the LFEs as a group on a national basis reduce average emissions to 85 per cent of business-as-usual projections. The federal government requires reporting of emissions under the Canadian Environmental Protection Act (CEPA). CEPA has also been identified as the mechanism for enforcing industry reductions. An alternative mechanism is the use of covenants; indeed the pulp and paper industry nationally has already signed such an arrangement with the federal government.



Courtesy: Abitibi Consolidated Ltd.

Abitibi Consolidated mill at Grand Falls - Windsor

Some local industries have been successful in making improvements in their energy use since 1990, which bodes well for local industry in terms of GHG intensity (GHG emissions per unit of output). The offshore oil industry, for example, has a good record in terms of GHG intensity as it uses relatively new, efficient technology.

Local industries are export-oriented and therefore compete on a world market. This means that the capability of local industries to make large investments to reduce their GHG emissions may be limited. Some industries have indicated that they are already committed to investments on other environmental issues and will need a clear picture of the priority areas.

Building Sector

Much has been done in Newfoundland and Labrador in recent years to improve the energy efficiency of the residential, commercial and institutional building stock. As noted earlier, the Government of Newfoundland and Labrador has been involved in retrofitting many of its buildings through energy performance contracts. These projects are financed by the reduction in energy expenses from the retrofits over a specified period of time.

Action 25: Government will promote energy efficiency in public and low income housing.

The Newfoundland and Labrador Home Builders Association administers the R2000 Program in partnership with Natural Resources Canada. This program promotes energy efficient house designs that meet stringent standards and provides training and support for builders.

One method for encouraging energy efficiency in the building sector could be the adoption of the model National Energy Codes for Houses and Buildings by the Province or individual municipalities. The National Energy Code has not yet been adopted in any jurisdictions and the home building industry is especially against implementation of the Code for fear that the added costs will slow down growth in the industry. A common response is that additional requirements for this sector, such as the adoption of the Energy Code or mandatory energy use reports, are not necessary and that the market approach has been successful over the years. More research on energy modelling is needed to determine potential and real energy savings resulting from renovation activity and to validate whether energy savings are actually achieved.

Courtesy, Eastern NL Homebuilders Association

House built to R-2001 standard.

The EnerGuide for Houses program of Natural Resources Canada offers homeowners advice on improving the energy performance of their homes. The most appropriate mechanism for sustained funding for this type of program will have to be determined if such programs are to continue in the future.

With respect to the institutional buildings, the health care sector has made substantial investment in energy retrofit in the last eight years (primarily in the major facilities and new construction), however, there still remain a significant number of facilities that need investment in energy retrofit work. There are many lessons to be learned from the experience in this area.

Natural Resources

Agriculture

Agriculture is a growing sector of the provincial economy but yet the industry employs over 4000 people and has combined sales of approximately $500 million annually. The major components of the industry are dairy (33%), chicken production (30%),

egg production (14%) and greenhouse products (11%), with the remaining 12 per cent being composed of the red meats, vegetables, fruits and fur sectors. Agriculture is responsible for approximately 10 per cent of GHG emissions on a national scale, but locally the emissions from agricultural production are minimal.[24] Greenhouse gas emissions from farms are mainly nitrous oxides (N_20), methane (CH_4) and carbon dioxide ($C0_2$) from non- energy sources, including fertilizers, manure and livestock.

On the other hand, climate change can seriously impact the development of local agriculture. Predictions about the impact on the Canadian agriculture sector include more extreme weather conditions, increases in pest problems and water shortages. Climate change could also have beneficial impacts such as a longer growing and frost-free season. These impacts are expected to vary from region to region. The net impact is not known and will depend somewhat on the adaptation measures taken. There are many different adaptation options for this sector including developments in technology, government programs, farm production practices and financial management.[25]

Agricultural Policy Framework Implementation Agreement

In 2003, Newfoundland and Labrador signed the Agricultural Policy Framework (APF) Implementation Agreement which outlines the measures that both the federal and provincial governments will undertake to deliver on the five elements of the agreement. These are: business risk management, food safety and quality, science and innovation, renewal and environment. Environment is a key consideration for APF. The new APF is cost-shared 60:40 and is valued at more than $32.4 million.

A number of initiatives have been developed or are currently under development in each of the key priority areas. Climate change is not specifically mentioned in the APF but many aspects of the climate change issue will be addressed in the various programs and initiatives under the framework. Some of these programs and their relationship with climate change are explained below.

As part of the Environmental Farm Planning Initiative all farms must have an environmental scan completed to be eligible for funding under any of the programs. If the scan identifies significant environmental concerns, then the farm must complete an environmental farm plan (EFP). The federal and provincial governments will provide support for the development and implementation of on-farm and regional environmental scans and plans.

The Northern Agrifoods Initiative will encourage the development and commercialization of a northern agrifoods industry. This program will encourage and foster diversification and commercialization of livestock, crops, fruits and native berries and other northern-based agrifoods industries. Longer and warmer frost-free seasons are a potential impact of climate change that would benefit agricultural development in northern areas.[26] Over the long-term, there may be some expansion northward of cultivation and livestock operations. A development strategy focussing on potential agricultural opportunities in the northern areas of the Province should be considered part of the Province's climate change adaptation strategy.

In the 2002 paper on climate change impacts and adaptation in agriculture, the Climate Change Impacts and Adaptation Directorate of Natural Resources Canada stated that "understanding how climate change will affect pests, pathogens and weeds is a critically important component of impact assessments

of climate change on agriculture."[27] Most predictions in this area are hypothetical and require more testing and local study. A number of initiatives under the APF will assist in adapting to new pests or pathogens that could be introduced in our Province with a changing climate. One initiative under the Food Safety and Food Quality element of the APF is the collection and analysis of locally produced foods or feedstuffs to detect and monitor the presence of harmful biological organisms or chemical residues. The Canada-Newfoundland and Labrador Food Safety and Security Program includes a Bio-safety Initiative that supports the development and adoption of bio-security protocols that prevent and monitor the entry of diseases into, or within, the industry. Another initiative, also under this program, is related to risk assessment and supports the study of disease risks associated with environmental change and increased movement of people and animals and the resultant vulnerability of provincial industries. These initiatives are to be accompanied by other initiatives focussed on data management and development of a traceability system for products and animals.

Through complex processes, climate change could have significant impacts on soil quality, soil erosion, nutrient leaching and runoff. The Canada-Newfoundland and Labrador Soil, Air and Water Quality Conservation and Enhancement Program provides support to projects that minimize the impacts or risks to soil, air, water and biodiversity as a result of agricultural activity. The objectives of this program will help local agriculture adapt through improved use of agri-environmental risk assessment and planning, improved nutrient and pathogen management and improved land and water management.

The Canada - Newfoundland and Labrador Technology Adoption Program is designed to help local farmers improve competitiveness through new technology and advances in science. The program also includes an initiative related to the evaluation and adoption of new crop varieties, non-traditional crops, cropping and storage systems. A diversification initiative provides assistance to producers to diversify into new crops, fruit, livestock and other sectors. Finally, the New Direction Research Program will also help with the development of new technologies and life science research programs. This program can provide valuable information that will help the industry adapt over the long term to a changing climate.

ACTION 26: Government will partner with academic institutions, industry and stakeholders to promote local research initiatives on carbon management.

Forests and Forest Resources

As the second largest country in terms of landmass, Canada accounts for nearly 10 per cent of the world's boreal and temperate forests. Approximately half of

Courtesy: M. Moroni, Canadian Forest Service

Forest in Western Newfoundland

Canada's land area (417 million hectares) is forested. In 2002, the value of exports from forest products was $43 billion and the sector directly employed 360,000 people. This Province's forest cover is 22.5 million hectares. In 2002, the export value of Newfoundland and Labrador's forest products was over $780 million and the sector supported almost 6100 direct full-time and seasonal jobs.

As with agriculture, forests can be impacted by climate change both positively and negatively. For example, a warmer climate and longer growing season should encourage increased tree growth, but at the same time increase incidents of pest outbreaks, drought and fire. Climate change is expected to impact upon biodiversity by changing the species composition of forest ecosystems.

ACTION 27: Government will continue to monitor developments in climate change science, decisions around carbon accounting and the impacts on forest management. Government will share this information with industry with an intent to revise the provincial forest management planning process and guidelines where appropriate.

Forests play an important role in the global carbon cycle and are thought to influence levels of atmospheric CO_2. Throughout their life cycles, forests can act as either sinks, reservoirs for carbon, or as sources, emitters of carbon. For example, when a forest grows it absorbs CO_2 and converts it into plant material, but when a forest is destroyed through activities such as land clearing or burning, it releases carbon into the atmosphere. The age-class structure of the forest also affects the forest's ability to sequester carbon since older trees sequester more carbon than young trees.

Canada has been an advocate of including the role forests play in the capture of carbon in international negotiations. The "Marrakesh Accords" (sub-agreements under the Kyoto Protocol) outline rules for land use, land use changes and forestry activities. Afforestation, reforestation and deforestation must be included in the accounting. Countries have until 2006 to decide whether to include forest and agricultural land management. Canada's limit for forest management sinks under the Kyoto Protocol is 44 Megatonnes (Mt). 'Business-as-usual' forestry and agricultural practices are predicted to generate a carbon sink of 30 Mt. However, this is an estimate only and more regional data are needed. The federal government, in collaboration with the provinces / territories and industry, is involved in research to develop the tools to measure the carbon stock of our forests.

The Model Forest Network and the Canadian Forest Service (CFS) are involved in a three-year project to develop a forest carbon accounting model for application at the scale of operational management units.[28] This model will build on previous work done on the CFS's Carbon Budget Model. The Western Newfoundland Model Forest (WNMF) was chosen as one of the two pilot sites. The Newfoundland Forest Service of the Department of Natural Resources is the lead partner in this pilot project that will model the effect of disturbances (eg. fires, insect outbreaks, harvesting) on forest ecosystem carbon stocks.

A proposal has already been developed by the Excellence in Risk Analysis (ERA) Group, a partnership between government, university and private sector, to study the forests and peatlands in this Province for their potential in sequestering carbon. This research is intended to provide a basis for decisions around carbon accounting that should lead to sustainable forest management.

To date, neither carbon sequestration nor climate change impacts have been considered in the forest management planning in the Province. However, the federal climate change plan indicates Canada's intention to allow sinks to be used as offsets in a domestic emissions trading system for "large final emitters." The federal government has signed a Memorandum of Understanding with the pulp and paper industry, represented by Forest Products Association of Canada (FPAC), which includes a commitment of industry and government to work together to gain knowledge about how forestry management practices impact on Canada's carbon stock.

Fisheries and Aquaculture

Commercial fishing and aquaculture industries are intrinsically linked to environmental conditions. However, the marine ecosystem is complex and often not well understood. The various natural linkages within this ecosystem, fish harvesting and other factors such as land-based marine pollution all impact on the development of this sector and make it difficult to ascertain the exact impact of climate change. As well, research on climate change impacts and potential adaptations in the Canadian fisheries sector has not been as extensive as in other sectors such as forestry and agriculture.

Action 28: Government will initiate dialogue with Fisheries and Oceans Canada, industry and stakeholders on climate change mitigation and adaptation.

The main commercial fisheries for Newfoundland and Labrador are shellfish, groundfish, pelagics and seals. The shellfish sector is today the dominant sector, representing approximately 80 per cent of the total landed value, or about $465 million in 2003. Of this sector, crab and shrimp are the most important species followed by soft shell clams and lobster. Groundfish landings in 2003 were valued at about $65 million. The main commercial groundfish species currently harvested are cod, turbot (Greenland halibut), yellowtail flounder and redfish. Pelagic landings, including herring, mackerel and capelin were valued at almost $17 million while the value of seals and seal products was about $12 million in 2003.

Courtesy: Dept. of Fisheries and Aquaculture

Aquaculture site

The Aquaculture Strategic Plan for Newfoundland and Labrador, developed in 1999 and adopted by all stakeholders in 2000, provides a framework for the development of aquaculture in this Province. The plan recommended that industry development focus on salmonids (Atlantic salmon and steelhead trout), Atlantic cod and blue mussels. The salmonid sector of the industry is based in the Bay d'Espoir/Connaigre Peninsula region of the south coast utilizing sea cage

sites and land based facilities. The full cycle Atlantic cod sector is primarily located in Fortune Bay while the cod grow-out sector is located on the northeast coast. It is anticipated that the Atlantic cod sector will adopt technology similar to salmonid aquaculture sector. The Green Bay and Notre Dame Bay areas of Newfoundland and Labrador are the major blue mussel production areas utilizing bottom moored, long-line technology. Aquaculture exports from this Province were valued $16 million in 2003.

Changes in environmental conditions affect species interaction, in particular predator-prey and parasite-host relationships, food webs and competition for resources in the marine ecosystem. Climate change may also lead to changes in water temperature, salinity and chemical composition as well as changes in water levels and ocean circulation patterns. These changes, in addition to human-induced factors such as marine pollution or overfishing, will impact the productivity and distribution of fish stocks.

There has been very little work completed to date that addresses the exact impact of climate change on the aquaculture industry, but aquaculture can also be expected to be impacted. Extreme weather, storm surges, coastal erosion, sea level rise are all likely impacts of climate change that can potentially affect the industry. Temperature changes may have both negative and positive impacts. Temperature affects sites and species suitable for farming as well as incidence of pests and disease. Commercially viable species may become challenged due to changes in temperature, salinity, and water quality resulting from global warming. The aquaculture sector may have to consider adapting to climate change with species diversification and development initiatives. Conversely, traditional species may experience enhanced growth and therefore, become more profitable. As the chemical composition of the ocean changes, various species of phytoplankton, zooplankton, and microscopic life will adapt accordingly. If there are any changes in the food chain because of a change in the ocean environment, aquaculture species such as blue mussels which filter feed on these organisms, could be impacted. Long-term development of this sector will have to include strategies to deal with the potential impacts of climate change.

Action 29: Government will work with industry partners and fishers to review regulations and policies limiting vessel lengths with a view to advocating for federal regulatory changes that will promote safety and fuel efficiency of vessels.

Jurisdiction over this sector is shared between the provincial Department of Fisheries and Aquaculture (DFA) and Fisheries and Oceans Canada (DFO). Many of the sector initiatives related to climate change would require partnership with the federal government. Partnerships with industry and other stakeholders would also be needed.

Energy Efficiency in the Fishing Industry

There may be opportunities for reduction of greenhouse gases through increased energy efficiency in both the harvesting and processing sectors. The energy efficiency of commercial fishing vessels in the Province can be improved. Design of fishing vessels is primarily motivated by length restrictions; fuel efficiency is often a secondary consideration. The efficiency of processing plants is not known and there may be opportunities to increase the efficiency in these plants as well.

In the 1980s, the Fisheries and Oceans Canada, Newfoundland Region, ran a program called ENER

Courtesy: Dept. of Fisheries and Aquaculture

65' Fishing vessel

SEA which had the objective of helping fishermen reduce vessel operation fuel costs. The program delivered energy efficiency advice and assistance directly to individual vessel owners throughout the Province. Between 1984 and 1988, savings from the program were approximately $1.5 million.[28]

Since the 1980s, the methods for analysis of fuel efficiency and technologies available to increase

ACTION 30: Government will raise awareness among members of the fishing industry on climate change impacts and emerging safety issues.

fuel efficiency aboard vessels will certainly have changed. However, with the help of partners, the concept could be revisited and updated to standards applicable in today's industry.

Government can also work towards increased energy efficiency in the fisheries sector by promoting technological development through partnerships with the local environmental industry and research institutes.

Although the full extent of climate change impacts on our marine environment is not known, the impacts that have been identified (for example, increased storm activity, changes in sea ice and icebergs) have implications for the safety of those people involved in the industry. In addition, the changing nature of the Newfoundland and Labrador fishery over the last

ACTION 31: Government will encourage the development and implementation of technologies, equipment and vessel design to increase fuel efficiency and safety aboard vessels.

decade has meant that vessels designed for inshore operations are travelling further offshore. A review of these vessels may be warranted in light of the changing climate. Improvements or redesign of these vessels may enhance safety and stability and also increase fuel efficiency.

Adaptation Element in Fisheries Management

Since there are gaps in our knowledge about how climate change could affect the Newfoundland and Labrador fishery, more research needs to be done on both the predicted changes in local climate and the

ACTION 32: Government will develop partnerships to encourage research on local climate change impacts on the fishing and aquaculture industries.

impacts that these changes will have on the industry. The focus on gaining more knowledge about the local situation is the first step in developing an appropriate adaptation strategy.

One adaptive strategy for the fishing industry is to have a diversified fishery that is less likely to be negatively impacted by changes in commercially

important fish stocks than a fishery that is dependent on only a few of these stocks. From 1999-2003, the Department of Fisheries and Aquaculture was involved in a Fisheries Diversification Program in partnership with Fisheries and Oceans Canada and the Atlantic Canada Opportunities Agency. The program invested $10 million into research on

Action 33: Government will engage industry stakeholders, other government departments and non-governmental organizations in research and development of commercial and emerging species.

harvesting and processing methods as well as potential markets for new or underutilised species. Continued funding for work in these areas could be part of a provincial adaptation strategy. The Department of Fisheries and Aquaculture has continued to place importance on fisheries diversification and emerging species. Although on a smaller scale, DFA continues to support initiatives that contribute to industry diversification.

Over the years, the Province's fishery has become increasingly specialized. Fish harvesters are required to be licensed and these licenses allow them to fish for specific species in specific locations.

Action 34: The provincial government will work in cooperation with the federal government and research institutions to promote policies that advocate sustainable harvest levels for commercial fisheries in light of climate change.

Fisheries are also managed on a species by species basis and quotas are set for individual species. The current management system may need to be reassessed to take into account how climate change will impact on the species composition in the Northwest Atlantic.

Courtesy: Dept of Tourism, Culture & Recreation

Ramea

Coastal Zone Planning

Impacts from climate change on the coastal zone can be expected for Newfoundland and Labrador. Increased storm frequency or severity will likely impact on the physical structures along the coastline

Action 35: Government will implement long-term environmental monitoring and assessment for existing and potential aquaculture sites.

and on the economic activities that take place in this area. Since most of the Province's fishing or aquaculture-related infrastructure (wharves, slipways, processing plants) is located in the coastal zone, increased damage to these structures might also be an effect of changes in climate. In addition to the direct costs of damaged infrastructure, commercial fishing activity could be disrupted as well resulting in even more economic losses.

Over the past 20 years, site criteria have been developed and proven for operating successful aquaculture activities in Newfoundland and Labrador. Climate change will require that established site criteria be reviewed and modified to reflect changing marine conditions. Existing aquaculture operations

will either have to be physically moved to new locations from current sites or new technology will be required to optimize marginal sites.

Action 36: Government will promote the consideration of climate change impacts in areas of the Province that have initiated efforts towards Integrated Coastal Zone Management Planning.

The aquaculture industry is one of many users that puts increasing demands upon our marine environment. As other sectors, such as fishing, tourism and transportation, adapt to their own issues and situations there is potential for conflict between all of the marine users. It will be imperative that all sectors begin to take a long-term approach and collaborative effort to integrated planning and management.

The assessment of sensitive fisheries and aquaculture infrastructure could form part of an overall provincial coastal zone management plan. Such a document would be more than a coastal land use plan and would include marine habitat and life as well. Provincial government and federal government departments and agencies should work toward the development and implementation of a formal coastline planning structure. The focus of this structure should be on a regional scale. From an aquaculture perspective, this would be applicable to areas of Newfoundland and Labrador's south coast such as Placentia Bay, Fortune Bay and the Bay d'Espoir/Connaigre region.

Developing an adaptive coastal strategy is a necessary component of the sector's response to climate change. A large-scale vulnerability assessment of the Atlantic coastline has been done that identifies sensitive areas in this Province.[30] However, local and site assessments are required to develop appropriate adaptive strategies in each case.

Marine Protected Areas (MPAs)

Currently in the Province there are several areas of interest that are being considered for MPA designation by the federal government. These areas include Gilbert Bay, Eastport and Leading Tickles. The MPA program recognizes the need for protection of unique species and sensitive or critical habitats. An MPA (under the Oceans Act) is therefore area-specific and can be affected by climate change on local, regional, and in some ways global scale. The MPA program currently concentrates efforts on what has the greatest impact on the unique species/habitat, that being both direct and indirect impacts of human activity. This may be an area for future collaboration between the provincial and federal governments.

Action 37: The provincial government will promote climate change awareness at the planning stages of Marine Protected Areas (MPAs) with a view to encouraging research and adaptive management in these areas.

In some instances, vulnerability of unique species and the sensitivity of their habitats are known. For the most part, however, it is unknown how sensitive species and their ecosystems will be to potential impacts of climate change. Climate change impacts are not specifically addressed in MPA planning at the present time.

Energy Resources

Electricity

Depending on rainfall levels and customer demand, about 75 per cent of the electricity used in the

Province is generated from hydroelectric sources. As a result, greenhouse gas emissions from electricity generation in Newfoundland and Labrador are very small – in the order of 1.5 megatonnes (Mt) per year — compared to the national total of about 120 Mt.

Growth in electricity generation is forecast to be quite modest through the end of the decade. Nevertheless, there is some growth: for example, a significant increase in energy demand is expected in 2012 when the Voisey's Bay Nickel hydromet plant is scheduled to begin operating at Argentia.

There are potential options for new generation, but there is little to no large-scale hydro potential available on the Island that could be considered acceptable environmentally, unless the need for drastic greenhouse gas emission reductions becomes so urgent as to override other concerns. There is a reasonable potential for smaller hydro projects,

Action 38: Government will implement an energy plan to ensure that all energy sources are used first to provide a reliable, affordable supply of power for domestic use and for Province-wide economic developments, and then to take advantage of business opportunities in export markets to sell energy that is excess to our needs on terms that secure maximum benefits for the Province.

which can be developed in quantities that fit the Province's projected electricity load growth. However, although many jurisdictions promote small hydro development as a means of reducing GHGs, such development is often opposed in this Province for environmental reasons, particularly on salmon rivers.

There are also other sources of renewable energy generation, such as wind power. Newfoundland and Labrador has a strong wind regime. However, the

Courtesy: Newfoundland & Labrador Hydro

Churchill Falls, Labrador

intermittent nature of this form of energy means that its total contribution will likely be limited to less than 10 per cent of the total electricity generation capacity for the Island grid.

There are two other options that could reduce GHG emissions from power generation in the Province - the construction of a power infeed line from Labrador and the delivery of offshore natural gas to the Island. There remains economic uncertainty with both.

Government has committed to implement an Energy Plan to ensure that all energy sources are used first to provide a reliable, affordable supply of power for domestic use and economic development. Energy that is excess to our needs can then be sold in export markets on terms that secure maximum benefits for the Province.

In the electricity sector, the Province's largest potential contribution to reducing Canadian emissions comes from the development of Labrador's vast hydroelectric resources. Since 1974, the Province has exported to Quebec roughly three times as much electrical energy as is used here, all of it from hydroelectric generation. This is part of the reason

The Churchill River Hydroelectric Resource

The Churchill River in Labrador is recognized as a significant source of renewable, relatively low cost, clean energy. The potential of this system has yet to be fully realized. Development of the untapped Lower Churchill resource could contribute almost 3000 megawatts (MW) of clean generating capacity towards meeting Canada's climate change objectives.

The existing eleven unit generating facility located at Churchill Falls has a generating capacity of 5,428 MW. The plant commenced operations in 1971 and generates an average of 34 Terawatt hours (TWh) or 34 million megawatt hours (MWh) annually.

The Lower Churchill Hydro Project includes two potential sites. Gull Island is located 225 km downstream from the existing facility. A second smaller site, Muskrat Falls, is located 60 km further downstream. Gull Island, the larger and more economically attractive development, has been cited by the Canadian National Energy Board as one of the best undeveloped hydro sites in North America.

A 2000 MW Gull Island development has the potential to produce an estimated 11.9 TWh of clean energy annually. This is sufficient energy to supply up to 800,000 - 1 million households annually. To generate an equivalent amount of power using an oil burning facility, 20 million barrels of oil would be required. An 824 megawatt development at Muskrat Falls could produce an estimated 4.8 TWh of energy annually.

Due to the northern location and small reservoirs, the potential projects are expected to have negligible carbon dioxide (CO_2) emissions. These developments could reduce greenhouse gas emissions that would otherwise be emitted from equivalent alternate power generation sources such as coal generation or combined cycle natural gas generation.

The amount of carbon dioxide emissions that could be avoided depends on the alternate fuel generation source being displaced, for example coal generation emits an estimated 2.6 times a combined cycle gas generator. Based on the estimated emission intensity of these examples of alternate power generation, the Lower Churchill displacement is estimated at approximately 15 megatonnes (Mt).

The projects are also attractive from an environmental perspective because of the small flooding areas required relative to the potential output. Both developments will be essentially "run of river" facilities. The Gull Island reservoir would involve flooding a narrow band of vegetation (85 km^2) along the length of the river. The anticipated flooding footprint for Muskrat Falls is estimated at about 36 km^2 .

The Government of Newfoundland and Labrador is committed to developing this hydro resource in an environmentally sensitive manner.

The projects will be subject to an environmental assessment process.

why electricity sector emissions from the electricity sector in Quebec are virtually negligible. Future hydroelectricity developments in Labrador have the potential to make a significant contribution to reducing national GHG emissions levels beyond the first Kyoto commitment period (2008-2012). Development of the Lower Churchill was included as a priority issue under the climate change MOU between Canada and Newfoundland and Labrador signed on April 29, 2005.

Oil and Gas

Although it is not possible to produce oil without also producing significant levels of greenhouse gas emissions, it is unavoidable that a significant part of the world's energy needs will be met by petroleum products for the immediate future. The oil producing facilities in the Province's offshore area actually have lower emissions per unit of output than conventional oil production. This is due to the scale of production and to the policy enforced by the Canada-Newfoundland Offshore Petroleum Board that gas produced with the oil in excess of that used for energy on the platforms be re-injected.

The actual development of our natural gas reserves is the subject of another commitment of Government. Its commitment is that a major mandate of the Newfoundland and Labrador Energy Corporation (to be created) will be to work with the major oil companies to develop natural gas as a competitively priced alternative energy source for the Province and for transportation to Canadian and U.S. markets.■

Courtesy: Dept. of Natural Resources

Terra Nova FPSO

Implementing Our Plan

Guiding Principles

The intent of the provincial Climate Change *Action Plan* is to effect positive change and contribute to national commitments under the Kyoto Protocol. The implementation of the *Plan* will not only reduce carbon dioxide emissions from the burning of hydrocarbons, it will also reduce other harmful environmental effects and provide economic benefits to companies, governments and individuals. This will motivate and focus energy-saving measures in all sectors.

Government has chosen the following principles to guide implementation of the *Action Plan*:

Leadership

Government, through the Minister of Environment and Conservation, will spearhead the provincial response to climate change. We will encourage broad-based actions through external initiatives and policies. Government will also continue to lead by example by improving energy efficiency and reducing waste from internal operations.

Public Awareness

Through individual action and appropriate consumer choices, the public can contribute to achieving the Plan's objectives. Each person can choose to use energy and resources more wisely and thereby reduce GHG emissions. Public education is necessary to lead to changes in behaviour and lifestyle. In turn, public input is also required to educate Government and other decision-makers about concerns, areas of interest and existing gaps in knowledge related to climate change.

Stakeholder Engagement

As local awareness grows on this subject, feedback from the public will help to inform Government's decisions on mitigation and adaptation activities. The success of the *Action Plan* will depend on a cooperative effort in all sectors. Local organizations and industry will be engaged in the ongoing development and implementation of initiatives. The involvement of stakeholders will encourage support for the Plan and identify economic opportunities for wide-ranging GHG reduction measures.

Promotion of Investment in Cost-effective Targeted Measures

Targeted measures are policy instruments such as efficiency regulations; building and housing codes and standards; and incentives that encourage investments in increased efficiency in the utilization of energy and natural resources. The Province, in collaboration with stakeholders, aims to identify and promote economically viable ways to achieve GHG reductions. While many opportunities, including retrofits of health care and other public sector facilities, have already been successfully acted upon, other opportunities for energy efficiency improvements remain untapped.

Promotion of Strategic Opportunities

Government views climate change not only as a challenge, but also as an opportunity for development of areas where the Province has a strategic advantage. The development of clean energy sources, such as hydroelectricity, is one area that Government will promote.

Achievement of Ongoing Environmental Objectives

Government takes the view that many of the initiatives to address climate change can also act as mechanisms towards achieving results in other important policy areas, such as sustainable development, waste management, energy development, coastal zone management and air quality.

Reporting and Accountability

As part of our ongoing dialogue with stakeholders and commitment to transparency, Government will report annually on local climate change initiatives and the progress made toward achieving emissions reductions.

Creating Partnerships

The development of strong partnerships will be key to achieving the goals of the *Action Plan*. Many of the actions outlined here benefit from the coordinated efforts from a number of parties, both internal and external to Government. The Government of Newfoundland and Labrador is working with potential partners to define the appropriate roles for the parties involved.

Government of Canada

The Government of Canada has also stressed the need for partners in moving forward in climate change.

Following the release of its Climate Change Plan for Canada, the federal government introduced an Opportunities Envelope to cost-share emissions reductions with provinces and territories. Over $160 million was announced for this initiative as well as $30 million for aboriginal and northern communities. In Budget 2005, the federal government established a Partnership Fund to replace and expand the Opportunities Envelope with funding of at least $50 million per year for the next five years.

The Government of Newfoundland and Labrador engaged in discussions with the federal government to determine mutual priorities to include in the MOU. There have also been discussions of the potential of federal funding for local projects. These discussions are expected to continue in the context of the new Partnership Fund.

Memorial University of Newfoundland

Memorial University of Newfoundland has for more than a decade been a leader in reducing its energy usage and therefore greenhouse gases. The University's first energy performance contract was completed in 1992 with annual energy cost savings in the order of $700,000 per year. The contract had a scheduled pay-out period of ten years, which was realized in just seven. A second energy performance contract undertaken jointly with the Health Science Centre is currently achieving savings of $170,000 per year.

The recently constructed Smallwood Student Centre, incorporates the use of an earth source heat pump system fed by 48 wells. The Ocean Science Complex in Logy Bay utilizes a large seawater-based heat recovery system. And the University routinely makes use of occupancy sensors, photocells and scheduling systems. to reduce its energy usage.

As both a major user of energy and a centre for climate change research, the University is well positioned to take on a leadership role in addressing climate change

Newfoundland and Labrador Environmental Industry Association (NEIA)

NEIA's mission is to grow and develop business in the environmental sector in Newfoundland and Labrador and to represent the industry through a unified voice.

NEIA has expressed an interest in partnering to address climate change. In a submission to Government, NEIA advocated the creation of a joint industry-government advisory group or round table to provide advice and input to ministers and Government in the development of climate change policy. This group or committee would consist of representatives from our major industry sectors, the environment sector, the Newfoundland and Labrador Federation of Municipalities, and officials from the Departments of Environment and Conservation, Natural Resources, Municipal and Provincial Affairs and Innovation , Trade and Rural Development. NEIA also recommended that this committee be chaired and work under a climate change secretariat reporting to Executive Council.

NEIA is active in educating its members about climate change and the implications for business. Representatives of the Department of Environment and Conservation have been invited to address members on a number of occasions. Recently, climate change was a topic at the March 2005 annual conference.

Municipalities

Communities in Newfoundland and Labrador have a significant role to play in reducing their greenhouse gases and adapting to the impact of climate change.

The federal government has made significant investments to the Green Municipal Funds to help municipalities reduce GHG emissions. The Federation of Canadian Municipalities (FCM) delivers this program on behalf of the federal government. Another FCM program aimed at reducing municipal GHG emissions is Partners for Climate Protection.

Government would like to partner with local municipalities and associations and FCM to ensure that municipalities in this Province are well positioned to participate in these programs.

Making Linkages

Implementation of the Climate Change *Action Plan* should not be an isolated event, but rather needs to be considered in relation to other important initiatives. Climate change is not a simple issue; instead it is cross-cutting and broad in nature. Whether it be a well-established way of doing business, or a brand new strategy, many of Government's current activities already deal with some aspect of climate change. Success in making these linkages will also lead to success in the implementation of this Plan.

Environmental Assessment Process

It is the view of the Province that project proponents, environmental assessment (EA) practitioners and decision-makers should be aware of any impacts projects being proposed may have on climate change or that climate change may have on projects of the long term.

Considerable work has been undertaken by the Federal/Provincial/Territorial Climate Change and Environmental Assessment Working Group in identifying appropriate mechanisms for incorporating climate change issues into the environmental assessment process. Following from this work, the Province has adopted the recommendations of the report "Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners." In

this regard, environmental assessments undertaken in this Province will require, as appropriate and applicable:

- the initial estimation/prediction of GHG emissions for projects;
- explicit, project specific consideration of GHG management in projects with medium to high emissions;
- review of all projects at the planning stage to promote consideration of best practices for the class or sector (i.e., lowest emissions intensity or volume);
- review of project plans in relation to provincial climate change policies or objectives;
- identification of project sensitivities to climate parameters and variability;
- review of existing studies and information on climate change and the local, regional or inter-provincial/ territorial changes to environmental conditions resulting from climate conditions, including trends and projections where available; and
- public interest decision-makers are made aware of the climate change context within which a project is being proposed.

Strategic Environmental Review

The Strategic Environmental Review process is intended for use by all departments for strategic evaluation of the environmental implications, including those related to climate change, of policy, plan and program proposals. This process will alert ministers and departmental executive to any potentially significant environmental consequences, both positive and negative, of their policy decisions. It is not intended for review of individual projects, which are adequately covered under environmental assessment and regulatory approvals. This process is currently being implemented by Government.

Sustainable Development Initiative

Government is working on the development of a Sustainable Development Act that will provide for the establishment of a Newfoundland and Labrador Round Table for Sustainable Development to promote sustainable development in the Province and strengthen its capacity for wise and cooperative stewardship of natural resources. The Sustainable Development Act will be the legislative framework for a Strategic Environmental Management Plan, which will have the long-term goal of achieving environmental and economic sustainability and a high quality of life for citizens of this Province. This initiative will support the *Climate Change Action Plan* by integrating environmental considerations into government decision-making and by promoting environmentally friendly technologies. Reduction in GHG emissions and more efficient use of fossil fuel energy are certainly key environmental issues that should be considered as part of sustainable development.

Natural Area Systems Plan

Government is working on the development of a Natural Areas Systems Plan to be implemented by the Department of Environment and Conservation. Creating and protecting natural areas supports the Province's ongoing commitment to preserve biodiversity. These areas may serve as study areas for scientific research and as benchmarks to monitor ecosystem changes, including those related to climate change.

Innovation Strategy

Government is committed to building a sustainable, diversified economy in which people and

communities throughout the Province can prosper. As part of this commitment, Government is developing an Innovation Strategy that will increase economic competitiveness; attract new investments; leverage federal investments; advance knowledge-based developments; and build a culture of innovation. This emphasis on innovation and technology fits well with the goals of this *Action Plan*.

Climate change initiatives present significant opportunity for the environmental industry and with strategic planning can stimulate economic growth and improve the productivity and efficiency of the Province's industrial sector. Investment in climate change will provide opportunities to develop and grow local business and will also result in new more efficient infrastructure and industrial facilities.

As a result of this *Action Plan* and initiatives at the federal level, we can anticipate growth in both the environmental and engineering sectors, as well consulting opportunities related to Clean Development Mechanism (CDM) and emissions trading.

Energy Plan

The process of developing a comprehensive energy plan for the province is under way. A consultation document will be released in 2005, and public consultations will be scheduled to follow. The final plan will provide a framework for the long-term guidance of future policies and directions related to all aspects of the energy sector in the province. The focus will be on ensuring that the benefits to Newfoundlanders and Labradorians resulting from the development and utilization of our energy resources are maximized.

The Energy Plan will also reflect the government's principles related to the environment and to the sustainable development of our province.

Courtesy: Dept. of Environment and Conservation

Robin Hood Bay, St. John's landfill.

Waste Management Strategy

The provincial waste management strategy, announced in 2002, calls for a 50 per cent reduction of waste going to landfills. Landfills contribute to climate change by acting as a source for methane gas from organic wastes. Diversion of these wastes from the landfill will lead to a reduction in the production of this gas. More than 30 per cent of the waste stream in this Province is fibre products that can instead be recycled. Government recently announced an office paper recycling initiative for the cities of St. John's and Mount Pearl and the towns of Paradise and Conception Bay South. New provincial regulations will require all businesses or institutions in these areas with 25 or more employees to participate in the program beginning September 1, 2005. Businesses with less than 25 employees will be required to participate as of March 1, 2006. It is expected that this program will be expanded to the rest of the Province at some future date. Areas such as Corner Brook and Lewisporte are involved in some sort of paper recycling initiative.

Delivery Mechanisms

The provincial climate change file is shared primarily between the Department of Environment and Conservation and the Department of Natural Resources. Environment and Conservation takes the lead on initiatives related to dispersed emission sources, climate change education and adaptation measures. Natural Resources is taking the provincial lead on matters related to Large Final Emitters.

Action 39: Government will include climate change considerations in its Sustainable Development Strategy.

Other provincial departments will be involved in implementing Government's *Action Plan* as it relates to their mandates.

Consultation and input from the public on a regular basis is an important part of this Plan. Stakeholders have told us that they would like to see the establishment of a stakeholder advisory committee to guide the implementation of the Plan. Since Government is already moving forward with establishing a provincial Round Table on Sustainable Development, and since climate change is a key issue related to sustainable development, we see an opportunity to use the Round Table to ensure public input into ongoing climate change initiatives.

The Province has limited capacity to undertake new initiatives without significant partnership support or without a reasonable anticipation of long-term benefits. However, many of the internal government initiatives will require little or no funding and can be incorporated within current departmental budgets. Projects on energy efficiency and "House in Order" initiatives offer significant operational savings over time.

It is foreseen that under bilateral arrangements, the Province will access federal climate change funding to undertake or support specific initiatives. Support funding for the enhancement of research and development in the Province – for example, increased research at Memorial University or the proposed Centre of Environmental Excellence – will be pursued through climate change and other funding sources. It is anticipated that cost shared and in-kind arrangements can be developed for such initiatives.

For the private sector, federal legislation on reductions in greenhouse gases will both directly and indirectly impact business operations. Many emissions reductions measures will result in co-benefits such as energy cost reduction and resource conservation. Some companies may exceed the required reductions and therefore have "credits" to sell. It will be a function of Government to ensure that industry is kept informed of its responsibilities and opportunities. Government will also ensure that our industries are treated in a fair and equitable manner with respect to legislated requirements.

Evaluation and Reporting

Greenhouse Gas Emissions Reporting

National reporting standards are now being developed in consultation with industry and the federal, provincial and territorial governments. The Province has participated in this activity and will continue to support the initiative.

Annual Update

In order to measure progress and to refine our *Action Plan* on an ongoing basis, Government will provide an annual update to the public on its activities and

initiatives. We will also participate in national reporting mechanisms and reporting activities through NEG/ECP. The first update will be developed for the 2005/2006 fiscal year. ■

Action 40: Government will report annually on the provincial Climate Change Action Plan.

Beyond Kyoto

This *Action Plan*, the federal government's Climate Change Plan for Canada, and the Kyoto Protocol are important initiatives, but they represent only part of the response to climate change that will be needed. In order to stabilize, and eventually reduce, greenhouse gas emissions more work will have to be done to go beyond current international commitments. Our efforts to deal with climate change, both in terms of the causes and impacts, will require a clear vision for our future society. We will need to place emphasis on long-term planning, on taking advantage of opportunities created by climate change and on a shift to a low-carbon economic base.

Challenge of Long-term Planning

Our response to climate change is two pronged (mitigation and adaptation) and both require special attention to long-term planning. Unfortunately, there are many difficulties associated with long-term planning. In terms of mitigation activities, long-term planning is needed around how economic development will proceed in this Province. While there is a clear need to reduce greenhouse gas emissions, we cannot forego all industrial activity to reduce these emissions. It will be necessary to develop alternate low-carbon fuel sources.

Climate change adaptation planning requires 50 to100 year planning while municipal land-use planning tends to operate on shorter time horizons. Political and financial commitment is needed to ensure climate change predictions are integrated into planning.

Another challenge is the need for more information on climate change impacts. It is difficult to convince decision-makers to make significant investments in infrastructure if the risk is not clear. Determining the appropriate level of analysis needed to make these decisions and educating decision-makers are other challenges.

Hydrogen Economy

Addressing climate change means a transition from an economy driven by carbon-intensive fuels to one which is based on more sustainable, less polluting sources of energy. One such low polluting energy source is hydrogen fuel.

Hydrogen has been recognized as a potential source of energy since the early 19th century. Hydrogen has the highest energy content per unit of weight of any known fuel. It is currently used in various industrial processes and as rocket fuel for the space industry. With further research and development, hydrogen could be used for generating electricity and as a vehicle fuel. Hydrogen as a fuel burns in either a gaseous or liquid state and creates less air pollution than fossil fuels.

Canada is already a world leader in fuel cell technology and the federal government in investing in research and development to help ensure that Canadian business continues to be an important player in this movement toward a hydrogen economy. In 2003, the federal government announced that $130 million was to be invested in development and commercialization of fuel cells and other technologies that would "form the basis of the emerging hydrogen economy."[1] The federal budget 2005 announced the development of a Sustainable Energy Science and Technology Strategy to build on earlier funding in technology. The challenge is to determine how Newfoundland and Labrador's businesses can take advantage of federal funding and research in this area.

The transition to a low-carbon energy economy is really a technological revolution. This revolution should not be considered as an economic burden, but as an opportunity. Recognition that this is a long-term issue supports priorities around research and development (R&D). The Province is active in promoting R & D in the private sector and is encouraging partnering between local industry and educational institutions.

The Climate Change Steering Committee of NEG/ECP, of which the Province is a member, is seeking direction on number of potential programs. One of these initiatives involves assembling a database of hydrogen research in the Northeast and working with research agencies, business and other organizations to develop a strategy for making the transition to the hydrogen economy.

Concluding Remarks

Climate Change is a global phenomenon that will impact our environment, our economy and our lifestyle for the foreseeable future. Our *Climate Change Action Plan* attempts to identify specific initiatives and general policies that allow us not only to make a contribution to the world effort to reduce greenhouse gases but also to develop the necessary adaptation strategies to prepare our own province to meet the potential long term impacts.

The *Action Plan* is intended to be sufficiently flexible to allow adjustments based on the evolution of climate change science, the development of new technologies and the practicalities of our fiscal response capabilities. In many cases, the true benefits of greenhouse gas reductions or adaptation strategies may not be fully realized for several generations and we will therefore have to think beyond direct benefits to ourselves. On the other hand, our failure to act will result in the transference of an increasingly greater burden to future generations.

Regardless of the vagaries and conflicts surrounding the debate on climate change, it is our view that many of the actions, particularly those related to efficiency and resource conservation, offer immediate and economically cost effective benefits. Such initiatives are good for the environment, good for the economy and in many case good for the "bottom line" of individual companies.

Our *Climate Change Action Plan* results, in part, from the input of the general public, various environmental groups, various impacted government departments and agencies and our colleagues in other jurisdictions. It is reasonable to expect that these groups will continue to be our partners and that others will join them in helping to implement the *Action Plan*. ■

Acknowledgements

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The Department of Environment and Conservation and the Department of Natural Resources have been involved in numerous federal / provincial / territorial meetings and conferences on climate change since the late 1990s. We thank all who participated in these events and who contributed indirectly to this *Action Plan*. ■

Endnotes

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